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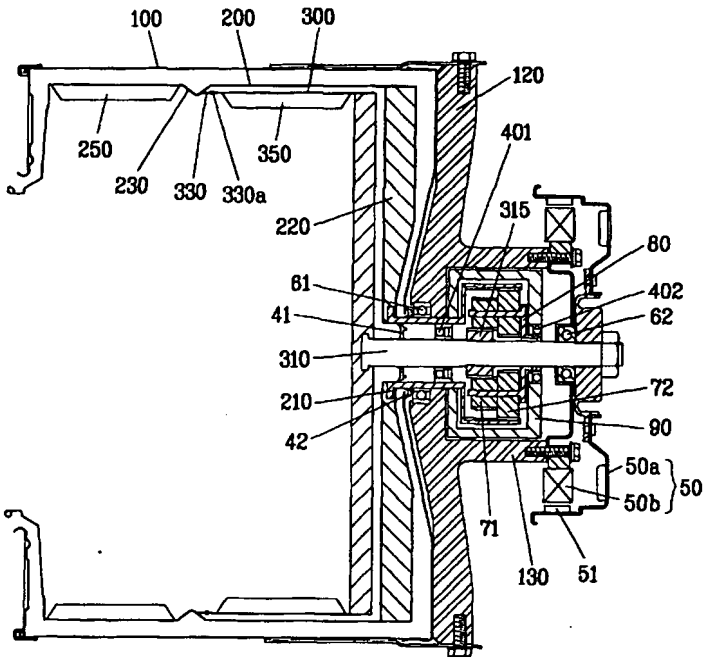

(57) Abstract: Drum type washing machine including a tub fitted in a cabinet, and a pair of drums fitted in the tub to be rotatable in opposite directions, thereby permitting to obtain an excellent washing effect as an entire surface of laundry is made to make uniform friction with the inner drum and the outer drum, and to prevent entangling of the laundry as the laundry is washing during the laundry back and forth the inner drum and the outer drum, alternately.

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DRUM TYPE WAHSING MACHINE

Technical Field

The present invention relates to a drum type washing machine, and more particularly, to a drum type washing machine, in which one pair of drums are mounted in a tub to be rotatable in opposite directions for washing.

Background Art

In general, the drum type washing machine, carrying out washing by a friction force between a drum rotated as a driving power of a motor part is received, and laundry in a state detergent, washing water, and the laundry are introduced into the drum, gives little damage to the laundry, has little entangling of the laundry, and can provide a washing effect of pounding and rubbing the laundry.

FIG. 1 illustrates a cross section of a related art drum type washing machine schematically, and FIG. 2 illustrates an enlarged view of "A" part in FIG. 1, referring to which the related art drum type washing machine will be explained. In the following explanation, a left side on the drawing is a front part of the drum type washing machine, and a right side on the drawing is a rear part of the drum type washing machine.

Referring to FIGS. 1 and 2, the related art drum type washing machine is provided with a cylindrical tub 2 inside of a cabinet 1, and a cylindrical drum 3 rotatably fitted inside of the cylindrical drum 3. There is a motor housing 10a in rear of a rear wall 2a of the tub 2 fastened thereto by fastening means 19 with a space for fitting a front, and a rear bearing 17, and 18 for rotatably supporting a driving shaft 3b. There are hanging springs 9 fitted between an inside of an upper part of the cabinet 1 and an upper part of an outside of the tub 2 for holding the tub 2, and a damper 8 between the inside of a lower part of the cabinet 1 and the outside of a lower part of the tub 2, for attenuating vibration of the tub 2 occurring during spinning. There is a spider 3a fixed to a driving shaft 3b which is passed through a central part of the tub 2, and coupled with a rotor 11 of a motor 10 part in outside of a rear wall 2a of the tub 2.

Accordingly, the rotor 11 rotates as a voltage is applied to a stator 12 in the motor part 10, and the driving shaft 3b rotates according to the rotation of the rotor 11.

The operation of the related art drum washing machine will be explained.

After laundry, detergent, and washing water are introduced into the drum 3, when power is applied to the stator 12 in the motor part 10, the rotor 11 rotates, which rotates the driving shaft 3b, that in turn rotates the drum 3. According to this, the laundry in the drum 3 is washed by friction with the washing water and the drum 3.

However, the related art drum type washing machine has the following problems.

First, in washing the laundry by the related art drum type washing machine, the laundry repeats cycling of being lifted up to a certain height along an inside surface of the drum 2 while rolling, and falling down by a lifter (not shown) on an inside surface of the drum 2, during which washing is done by the friction occurred between the laundry, the drum 2, and the lifter. However, the one direction rotation of the drum 2 for a preset time period makes the laundry in the drum 2 to continue one direction rolling, and rotation, and falling down to the lower part of the drum, that causes partially concentrated washing, not uniform washing throughout the laundry, resulting in non-uniform washing, and require much time.

Second, the continuous one direction rolling, and rotation of the laundry during washing makes many pieces of the laundry in the drum 2 to be liable to entangle to one another, and continue the one direction rotation in an entangled state, to result in damage to the laundry.

Disclosure of Invention

Accordingly, the present invention is directed to a drum type washing machine that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a drum type washing machine, which can prevent entangling of laundry, and enhance a washing efficiency.

Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, the drum type washing machine includes a tub fitted in a cabinet, and a pair of drums fitted in the tub to be rotatable in opposite directions.

The pair of drums includes an outer drum rotatably fitted in the tub, and an inner drum rotatably fitted in the outer drum having a diameter and a length smaller than the outer drum, respectively.

The outer drum preferably includes an inward ridge projected radially from a circumference of the outer drum at a position opposite to a fore end of the inner drum for maintaining sealing between the inner drum and the outer drum, and further provided with sealing means for preventing infiltration of water into a gap between the ridge and the inner drum.

The inner drum has a rear end connected to the rotor in a motor part by an inner drum shaft, there is a stator fixed to a rear end of a rear wall of the tub inside of the rotor, the outer drum has a rear end fixed to an outer drum shaft, and the outer drum shaft has a rotation force transmission device provided thereto for transmission of the rotation force of the inner drum shaft to the outer drum shaft.

Preferably, the outer drum shaft is rotatably supported at an outer circumference thereof on a front bearing fitted an a fore end of a gear box housing formed in a rear wall of the tub, and the inner drum shaft is rotatably supported at an outer circumference thereof on a rear bearing fitted at a rear end of the bearing housing.

The rotation force transmission device includes a gear box fixed inside of the gear box housing having opened fore end and rear end for allowing the inner, and outer drum shaft to pass therethrough or be inserted therein, a sun gear fitted coaxially with

the inner drum shaft for interlocked rotation with the inner drum shaft, a plurality of planetary gears for being rotated by receiving rotation force from the sun gear, a shaft extension extended from the rear end of the outer drum shaft having an inner circumference with a gear part for engagement with the planetary gears, a carrier having a rotation shaft in front of a base, which is a rotation center of the planetary gears, and an extension in rear of the base positioned between the inner drum shaft and a rear opening in the gear box, first one way rotation means between an outside circumference of the inner drum shaft and an inside circumference of the outer drum shaft for permitting one way interlocked rotation of the inner, and outer drum shafts, and second one way rotation means between an inside circumference of the rear end opening in the gear box and an outside circumference of the extension of the carrier for permitting one way rotation of the carrier.

Preferably, the sun gear is formed as a unit with the inner drum shaft, and the planetary gear includes two gears having radiuses, and numbers of teeth, both different from each other fixed as one unit coaxially.

Preferably, the carrier rotates in a direction the same with a rotation direction of the inner drum shaft centered on an axis of the inner drum shaft as the inner drum shaft rotates.

The first, and second one way rotation means may be one way bearings.

Preferably, there is an oilless bearing between the outside circumference of the inner drum shaft and the inside circumference of the extension of the carrier, and more preferably, the drum type washing machine further includes sealing means between an outside circumference of the inner drum shaft in rear of the oilless bearing and an inside circumference of the extension of the carrier.

Preferably, the first one way rotation means permits opposite direction rotation of the inner drum shaft and the outer drum shaft in washing, and holds the outer drum shaft so as to rotate in a direction the same with the inner drum shaft in spinning.

Preferably, the second one way rotation means restricts such that the gear box and the carrier rotate in the same direction in washing, and permits opposite direction

rotation of the gear box and the carrier in spinning.

Preferably, the shaft extension has a diameter greater than a diameter of the outer drum shaft, and smaller than a diameter of the gear box.

In the meantime, the inner drum is rotated as the inner drum receives a driving force from a driving motor separately fitted to one side of the tub, the outer drum is fixed to the outer drum shaft at a rear end thereof, and the outer drum shaft is provided with a rotation transmission device for transmission of a rotation force from the inner drum shaft to the outer drum shaft.

A power transmission to the inner drum is made by a driving motor fitted in a lower part of the tub, a motor pulley coupled to the driving motor, a drum pulley coupled to the inner drum shaft, and belt means for transmitting the rotation force from the motor pulley to the drum pulley.

The tub preferably includes a bearing housing formed as one unit therewith at a central part thereof having a front part and a rear part fitted with a front bearing and a rear bearing respectively, for supporting an outside circumference of the outer drum shaft, and there is preferably a gear box in rear of a rear wall of the tub for holding the rotation transmission device therein.

The gear box includes a flange formed along an outside circumference of a front part for fastening the gear box to the rear wall of the tub by fastening means. The flange has a plurality of holes along a circumference for passing fastening means, and the tub has fastening holes in the rear wall at positions corresponding to the holes in the flange.

Preferably, the drums include a plurality of lifters elongated along an axis direction, and projected form an inside surface to a radial direction.

Preferably, the lifter on the inside surface of the inner drum has a section becoming the smaller as it goes to a front part in an axis direction, and the lifter on the inside surface of the outer drum has a section becoming the smaller as it goes to a rear part in an axis direction.

The lifter has a triangular section, or preferably, the lifter has an "M" section,

to form a groove in a top part in a radial direction.

Preferably, the lifter on the inside surface of the inner drum has a helical form for moving the laundry and water in the drum forward (door side) along an axis direction as the inner drum rotates in washing, and the lifter on the inside surface of the outer drum has a helical form for moving the laundry and water in the drum backward along an axis direction as the outer drum rotates in washing.

In another aspect of the present invention, there is provided a drum type washing machine including an outer drum rotatably fitted in a tub, having a rear end an outer drum shaft fixed thereto, the outer drum shaft having a rear end coupled to a stator fixed to a rear end of a rear wall of the tub, an inner drum rotatably fitted in the outer drum, having a rear end an inner drum shaft fixed thereto, the inner drum shaft having a rear end coupled to a rotor in the motor part, a gear box housing extended in a rear direction from a front through hole formed in a central part in rear of a rear wall of the tub formed as one unit with the rear wall, to form a cavity, having a rear through hole in a rear end thereof, a front bearing, and a rear bearing fitted in the front through hole and the rear through hole for rotatably supporting an outside circumference of the outer drum shaft and the outside circumference of the inner drum shaft, respectively, and a rotation force transmission device including a gear box fixed inside of the gear box housing having opened fore end and rear end for allowing the inner, and outer drum shaft to pass therethrough or be inserted therein, a sun gear fitted coaxially with the inner drum shaft for interlocked rotation with the inner drum shaft, a plurality of planetary gears for being rotated by receiving rotation force from the sun gear, a shaft extension extended from the rear end of the outer drum shaft having an inner circumference with a gear part for engagement with the planetary gears, a carrier having a rotation shaft in front of a base, which is a rotation center of the planetary gears, and an extension in rear of the base positioned between the inner drum shaft and a rear opening in the gear box, first one way rotation means between an outside circumference of the inner drum shaft and an inside circumference of the outer drum shaft for permitting one way interlocked rotation of the inner, and outer drum shafts,

and second one way rotation means between an inside circumference of the rear end opening in the gear box and an outside circumference of the extension of the carrier for permitting one way rotation of the carrier.

In further aspect of the present invention, there is provided a drum type washing machine including an outer drum rotatably fitted in a tub, having a rear end an outer drum shaft fixed thereto, the outer drum shaft having a rear end passed through a central part of a rear wall of the tub to outside thereof, a driving motor fitted in a lower part of the tub having a driving shaft coupled to a motor pulley, an inner drum rotatably fitted in the outer drum, having a rear end an inner drum shaft fixed thereto, the inner drum shaft having a rear end coupled to a drum pulley for receiving a rotation force from the driving motor by means of belt means, a gear box fastened to a rear side of the rear wall of the tub by fastening means, having openings in a front end, and a rear end for passing, or inserting the inner, and the outer drum shafts, and a cavity therein, a front bearing, and a rear bearing fitted in a front part, and rear part of the bearing housing for rotatably supporting an outside circumference of the outer drum shaft, and a rotation force transmission device including a sun gear fitted coaxially with the inner drum shaft for interlocked rotation with the inner drum shaft, a plurality of planetary gears for being rotated by receiving rotation force from the sun gear, a shaft extension extended from the rear end of the outer drum shaft having an inner circumference with a gear part for engagement with the planetary gears, a carrier having a rotation shaft in front of a base, which is a rotation center of the planetary gears, and an extension in rear of the base positioned between the inner drum shaft and a rear opening in the gear box, first one way rotation means between an outside circumference of the inner drum shaft and an inside circumference of the outer drum shaft for permitting one way interlocked rotation of the inner, and outer drum shafts, and second one way rotation means between an inside circumference of the rear end opening in the gear box and an outside circumference of the extension of the carrier for permitting one way rotation of the carrier.

As has been explained, the drum type washing machine of the present

invention permits to obtain an excellent washing effect because an entire surface of laundry is made to make uniform friction with the inner drum and the outer drum, and to prevent entangling of the laundry because the laundry is washed during the laundry goes back and forth the inner drum and the outer drum, alternately.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

Brief Description of Drawings

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention:

In the drawings:

FIG. 1 illustrates a cross section of a related art drum type washing machine schematically;

FIG. 2 illustrates an enlarged view of "A" part in FIG. 1;

FIG. 3 illustrates a cross section of a drum type washing machine in accordance with a first preferred embodiment of the present invention;

FIG. 4 illustrates an enlarged view of a key part of FIG. 3;

FIG. 5 illustrates a cross section of a drum type washing machine in accordance with a second preferred embodiment of the present invention;

FIG. 6 illustrates lifters employed in the drum type washing machine of the present invention, schematically;

FIG. 7 illustrates a variation of a lifter employed in the drum type washing machine of the present invention, schematically; and,

FIG. 8 illustrates another variation of a lifter employed in the drum type washing machine of the present invention, schematically.

Best Mode for Carrying Out the Invention

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. For convenience of description, a left side on the drawing is a front side of a drum type washing machine, and a right side on the drawing is a rear side of the drum type washing machine.

FIRST EMBODIMENT

FIG. 3 illustrates a cross section of a drum type washing machine in accordance with a first preferred embodiment of the present invention, and FIG. 4 illustrates an enlarged view of a key part of FIG. 3, referring to which a system and operation of the drum type washing machine of the present invention will be explained.

Referring to FIG. 3, the drum type washing machine in accordance with a first preferred embodiment of the present invention includes a tub 100 inside of a cabinet, and an outer drum 200 having an opening in a front part rotatably fitted inside of the tub 100. There is an inner drum 300 inside of the outer drum 200 having an opening in a front part, a diameter smaller than the outer drum 200, and a length in an axis direction coaxial with the outer drum 200. The outer drum 200 has an inward ridge 230 at a position opposite to a fore end of the inner drum 300, which may or may not be formed as one unit with the outer drum 200. There is sealing means 330 at the fore end of the inner drum 300 adjacent to the inward ridge 230 fastened by fastening means 330a, such as bolt, or screw, for preventing the laundry from coming into a gap between the inner drum 300 and the outer drum 200. The sealing means 330 in a form of a circular ring having a diameter in correspondence to the diameter of the inner drum 300, and a width, is fastened along an edge of the fore end of the inner drum 300 by the fastening means 330a. Though, the sealing means 330 may be fitted to the inner drum 300 such that a fore end of the sealing means 330 is in contact with the inward ridge 230, for preventing the laundry from coming into the gap, the contact between the sealing means 330 and the inward ridge 230 may cause problems of friction noise, and

wear during rotation of the drums 200, and 300. Therefore, it is preferable that there is a minimum gap between the inward ridge 230 and the sealing means 330 enough to prevent the inward ridge 230 and the sealing means 330 from coming into contact. The sealing means 330 is preferably formed of plastic having little noise, and being heat, and abrasion resistant.

The inner drum 300 and the outer drum 200 of the present invention is fitted to be rotatable by the motor part 50 connected through a shaft in rear of the inner drum 300 and the outer drum 200, which will be explained in detail.

There is an inner drum shaft 310 having one end fixed to a rear end of the inner drum 300, and a rear end passed through the rear wall 120 of the tub 100, and coupled with the motor part 10 in rear of the tub 100. There is a spider 220 fixed to a rear end of the outer drum 200, and an outer drum shaft 210 connected to a central part of the rear end of the outer drum 200, for taking rotation force of the inner drum shaft 310 through a rotation force transmission device, and first, and second one way rotation means 401, and 402, which will be explained, later. There is a gear box housing 130 in rear of a rear wall 120 of the tub 100 having a cavity formed as a unit with the tub 100, in which the outer drum shaft 210, and the inner drum shaft 310 are rotatably fitted, together with the rotation force transmission device. There is a cylindrical gear box 90 inside of the gear box housing 130, having openings in front, and rear part.

Referring to FIG. 4, the gear box housing 130 has a front through hole 121 in a central part of a front part of the gear box housing 130 (i.e., the rear wall 120 of the tub 100), and a rear through hole 122 in a central part of rear of the gear box housing 130 with a diameter enough to pass the inner drum shaft 310. There is a front bearing 61 in a front part of the front through hole 121, and a rear bearing 62 in a rear part of the rear through hole 122. In this instance, an inner lace of the front bearing 61 rotatably supports an outer circumference of the outer drum shaft 210, and an inner lace of the rear bearing 62 rotatably supports an outer circumference of the inner drum shaft 310.

In the meantime, both the outer drum shaft 210 and the inner drum shaft 310 pass through the rear wall 120 of the tub 100, and are rotatably supported, and take

rotation force of the motor part 10, in rear of the rear wall 120, which will be explained, in detail.

The inner drum shaft 310 passes through the rear through hole 122 of the gear box housing 130, and coupled with a rotor 50a in the motor part 50 by known fastening means, such as bolt, and the like, at a rear end thereof. There is a stator 50b fitted to a rear end of the gear box housing 130, with magnets 51 of the rotor 50a devised to come opposite to the stator 50b in an outer side of the stator 50b in a radial direction, to form a motor part 50 for generating the rotating force by means of the rotor 50a and the stator 50b. Accordingly, upon application of power to the motor 50, the rotor 50a rotates in regular/reverse direction, to rotate the inner drum 300 in regular/reverse direction too as the inner drum shaft 310 coupled to the rotor 50a rotates.

According to the first embodiment drum type washing machine of the present invention, the inner drum 300 and the outer drum 200 are designed to rotate in opposite directions (for an example, the inner drum rotates in a clockwise direction, while the outer drum rotates in a counter clockwise direction) in washing, and to rotate in the same direction (for an example, both the inner drum, and the outer drum rotate in the counter clockwise direction) in spinning. The opposite direction rotation of the inner drum 300, and the outer drum 200 is implemented by the rotation force transmission device, and the same direction rotation of the inner drum 300, and the outer drum 200 is implemented by the first, and second one way rotation means 401, and 402, permitting a reverse direction rotation of the outer drum 200 with respect to a rotation direction of the inner drum 300 in washing, and the same direction rotation of the inner drum 300 and the outer drum 200 in spinning.

The rotation force transmission device, and the first, and second one way rotation means 401, and 402 will be explained, in detail.

The spider 220 is fixed to the rear end of the outer drum 200, and the outer drum shaft 210 is fixed to a central part of rear end of the outer drum 200. The outer drum shaft 210 has a cylindrical shaft extension 215 extended to inside of the gear box 90, inside of which there is a gear part 215a. The shaft extension 215 has a diameter

greater than a diameter of the outer drum shaft 210, and smaller than a diameter of the gear box 90. There is a sun gear 315 coaxial to the inner drum shaft 310 for rotation together with the inner drum shaft 310. There are a plurality of planetary gears 71, and 72 for taking, and being rotated by a rotation force of the sun gear 315, each of which planetary gears 71, and 72 has two gears fitted coaxially as one unit, with different radiuses, and number of teeth. The planetary gears 71, and 72 are supported on respective rotation shafts 81 on a base 82 of a carrier 80, and engaged with the gear part 215a of the shaft extension 215, for transmission of a rotation force of the sun gear 315 to the outer drum shaft 210. There is an extension 83 from rear of the base 82 extended to a rear direction between the inner drum shaft 310 and the rear end opening of the gear box 90, with a gap between the extension 83 and the outer circumference of the inner drum shaft 310. There is an oilless bearing 89 and sealing means 88 between the extension 83 and the outer circumference of the inner drum shaft 310 in succession for making a space between the extension 83 and the inner drum shaft 310 air tight. On the other hand, there is sealing means 41 between the inner circumference of the outer drum shaft 210, and the outer circumference of the inner drum shaft 310 for preventing leakage of water to the gear box 90. Also, There is sealing means 42 between the outer circumference of the outer drum shaft 210 and the spider 220 in rear of the outer drum 200 for preventing leakage of water to the front bearing 61.

As has been explained, the rotation force transmission device implements the opposite direction rotation of the inner drum 300 and the outer drum 200 of the present invention in washing. However, the inner drum 300 and the outer drum 200 are required to rotate in the same direction at a fast speed in spinning, to require separate means for rotating the inner drum 300 and the outer drum 200 in the same direction, which is implemented by the first, and second one way rotation means 401, and 402 which will be explained in detail.

There is the first one way rotation means 401 between the outer circumference of the inner drum shaft 310 and the inner circumference of the outer drum shaft 210 for

one way interlocked rotation of the inner, and outer drum shafts 310, and 210.

There is the second one way rotation means 402 between the inner circumference of the rear end opening of the gear box 90, and the outer circumference of the extension 83 of the carrier 80 for one way rotation of the carrier 80. That is, the first, and second one way rotation means 401, and 402 may be one way bearings, for forming an interlocked rotation system in which, for an example, when the rotor 50a is rotated in the counter clockwise direction in spinning to rotate the inner drum rotation shaft 310 in the counter clockwise direction, the outer drum shaft 210 is also rotated in the counter clockwise direction like the inner drum shaft 310 by restriction of the first one way rotation means 401. As has been explained, when both the inner drum shaft 210, and the outer drum shaft 310 are rotated in the counter clockwise direction, both the sun gear 315 on the inner drum shaft 310, and the planetary gears 71, and 72 engaged with the gear part 215a of the shaft extension 215 are remained stationary. Accordingly, the carrier 80 is also rotated in the counter clockwise direction interlocked with the inner, and outer drum shafts 310, and 210. As has been explained, it is needless to say that, under a state all the inner, and outer drum shafts 310, and 210, and the carrier 80 make an interlocked, counter clockwise rotation in spinning, the second one way rotation means 402 is fitted so as not to restrict the rotation in a rotation direction (counter clockwise direction) of the carrier 80.

In the meantime, the reason that the second one way rotation means 402 is fitted such that counter clockwise rotation of the carrier 80 is permitted, while clockwise rotation of the carrier 80 is not permitted, is as follows. That is, rotation directions of the inner drum shaft 310 and the outer drum shaft 210 are opposite in washing, when the carrier 80 has a rotation direction the same with the inner drum shaft 310. In this instance, if rotation of the carrier 80 is restricted, a rotation force of the outer drum shaft 210 can be maintained, positively.

There are two planetary gears 71, and 72 on the shaft 81 of the carrier 80 having different radiuses and numbers of teeth, for an appropriate adjustment of a rotation speed of the inner drum 300 and the outer drum 200 by an appropriate change

of the radiuses and the numbers of gear teeth. That is, an appropriate adjustment of a rotation ratio of the inner drum 300 and the outer drum 200 facilitates an enhancement of the washing efficiency.

SECOND EMBODIMENT

FIG. 5 illustrates a cross section of a drum type washing machine in accordance with a second preferred embodiment of the present invention.

Referring to FIG. 5, the drum type washing machine in accordance with a second preferred embodiment of the present invention includes a driving motor 30 fixed on one side of a tub 100, and a motor pulley 34 fitted on a shaft of the driving motor 30. There is a drum pulley 214 coupled to a rear end of an inner drum shaft 310 fixed to a central part of a rear end of an inner drum 300, and the drum pulley 214 is connected to the motor pulley 34 by belt means 35, for transmission of a rotation force of the driving motor to the inner drum 300.

On the other end, there is an outer drum 200 having a rear end fixed to an end of an outer drum shaft 210, which receives a rotation force from the inner drum shaft 310 through a rotation transmission device, and first, and second one way rotation means 401, and 402 almost identical to ones in the first embodiment. There is a bearing housing 120a in a central part of a rear wall 120 of the tub 100 formed as one unit with the rear wall 120, and there are a front bearing 61, and a rear bearing 62 at a front part, and a rear part of the bearing housing 120a respectively, for rotatably supporting an outer circumference of the outer drum shaft 210.

In the meantime, there is a cylindrical gear box 90 in rear of the rear wall 120 of the tub 100 for holding the rotation transmission means therein, having a flange 91 at a front part thereof formed along an outer circumference for fastening by means of fastening means 93, such as bolts, and the like, fastened to the rear wall 120 of the tub 100. The flange 91 has a plurality of holes 91a along a circumference thereof for passing the fastening means 93, and the rear wall 120 of the tub 100 has fastening holes 121 at positions in correspondence to the holes 91a for mounting the gear box 90 to the

tub 100.

The foregoing inner drum 300 and the outer drum 200 designed to be driven by the rotation force received from the driving motor 30 through the pulleys 34, and 214, since system and operation of the rotation force transmission means, and the first, and second one way rotation means 401, and 402 have identical systems and operation with the first embodiment, detailed explanation of which will be omitted.

In the meantime, there are a plurality of lifters each projected from an inside surface of the inner drum 300 and the outer drum 200 of the drum type washing machine of the present invention in an inward radial direction, and elongated along an axis direction of the drums, which will be explained with reference to the attached drawings. FIG. 6 illustrates lifters employed in the drum type washing machine of the present invention, schematically.

Referring to FIG. 6, the lifter 360 on an inside surface of the inner drum 300 has a helical form, so that, as shown in the drawing, the inner drum 300 pushes the laundry, and water held in the inner drum 300 forward along an axis direction of the inner drum 300 as the inner drum 300 rotates in an arrow direction 'a' (for an example, a clockwise direction) in washing.

Opposite to this, the lifter 260 on an inside surface of the outer drum 200 has a helical form, so that the outer drum 200 pushes the laundry, and water held in the outer drum 200 backward along an axis direction of the outer drum 200 as the outer drum 200 rotates in an arrow direction 'b' (for an example, a counter clockwise direction) in washing.

Moreover, the lifter 260 has a section formed the smaller as it goes from the front part to the rear part of the drum, and the lifter 360 has a section formed the smaller as it goes from the rear part to the front part of the drum. Therefore, when the outer drum 200 and the inner drum 300 rotate in directions opposite to each other, the laundry held in the outer drum 200 gradually moves toward the inner drum 300 together with washing water as the laundry repeats cycling of rolling, and being lifted upward by the lifter 260, and falling down. The laundry moved to the inner drum 300

gradually moves toward the outer drum 200 together with washing water as the laundry repeats cycling of rolling, and being lifted upward by the lifter 360, and falling down. That is, as the laundry and washing water repeat the cycling in washing, there are opposite water flows formed on the same time in a washing space formed by the inner drum 300 and the outer drum 200, thereby permitting an entire surface of the laundry to make friction with entire inside surfaces of the inner drum 300 and the outer drum 200 uniformly, and resolving entangling of the laundry as the laundry is washed during the laundry moves to and from the inner drum 300 and the outer drum 200, alternately.

FIG. 7 illustrates a variation of a lifter employed in the drum type washing machine of the present invention, schematically. Referring to FIG. 7, the lifter 270, or 370 has a triangular section; the lifter 270 has a section becoming the smaller as it goes from a front part to a rear part of the drum, and the lifter 370 has a section becoming the smaller as it goes from a rear part to a front part of the drum.

FIG. 8 illustrates another variation of a lifter employed in the drum type washing machine of the present invention, schematically. Referring to FIG. 8, alike the lifters in FIGS. 6 and 7, the lifter 280 has a section becoming the smaller as it goes from a front part to a rear part of the drum, and the lifter 380 has a section becoming the smaller as it goes from a rear part to a front part of the drum. Moreover, the lifter 280, or 380 has an "M" section to form a groove 280a, or 380a for forming a partial vortex at a radial inward top of the lifter 280, or 380. As explained, the groove 280a, or 380a is formed at a radial inward top of the lifter 280, or 380 to form partial vortex at the groove 280a, or 380a in washing, for enhancing a washing efficiency.

It will be apparent to those skilled in the art that various modifications and variations can be made in the drum type washing machine of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

Industrial Applicability

As has been explained in detail, the drum type washing machine of the present invention has an advantage of enhanced washing performance as the one pair of drums fitted inside of a tub designed to rotate in opposite directions in washing, form opposite direction water flows on the same time in a washing space of the drums, to make an entire surface of the laundry to come into friction with inside surfaces of the inner drum and the outer drum, uniformly, and another advantage of preventing entangling of the laundry since the laundry is washed as the laundry goes back and forth the inner drum and the outer drum alternately.

What is Claimed is:

1. A drum type washing machine comprising:

a tub fitted in a cabinet; and,

a pair of drums fitted in the tub to be rotatable in opposite directions.

2. A drum type washing machine as claimed in claim 1, wherein the pair of drums includes;

an outer drum rotatably fitted in the tub, and

an inner drum rotatably fitted in the outer drum having a diameter and a length smaller than the outer drum, respectively.

3. A drum type washing machine as claimed in claim 2, wherein the outer drum includes an inward ridge projected radially from a circumference of the outer drum at a position opposite to a fore end of the inner drum for maintaining sealing between the inner drum and the outer drum.

4. A drum type washing machine as claimed in claim 3, further comprising sealing means for preventing infiltration of water into a gap between the ridge and the inner drum.

5. A drum type washing machine as claimed in claim 2, wherein, the inner drum has a rear end connected to the rotor in a motor part by an inner drum shaft, there is a stator fixed to a rear end of a rear wall of the tub inside of the rotor, the outer drum has a rear end fixed to an outer drum shaft, and the outer drum shaft has a rotation force transmission device provided thereto for transmission of the rotation force of the inner drum shaft to the outer drum shaft.

6. A drum type washing machine as claimed in claim 5, wherein the outer drum shaft is rotatably supported at an outer circumference thereof on a front bearing

fitted an a fore end of a gear box housing formed in a rear wall of the tub, and the inner drum shaft is rotatably supported at an outer circumference thereof on a rear bearing fitted at a rear end of the bearing housing.

7. A drum type washing machine as claimed in claim 5, wherein the rotation force transmission device includes;

a gear box fixed inside of the gear box housing having opened fore end and rear end for allowing the inner, and outer drum shafts to pass therethrough or be inserted therein,

a sun gear fitted coaxially with the inner drum shaft for interlocked rotation with the inner drum shaft,

a plurality of planetary gears for being rotated by receiving rotation force from the sun gear,

a shaft extension extended from the rear end of the outer drum shaft having an inner circumference with a gear part for engagement with the planetary gears,

a carrier having a rotation shaft in front of a base, which is a rotation center of the planetary gears, and an extension in rear of the base positioned between the inner drum shaft and a rear opening in the gear box,

first one way rotation means between an outside circumference of the inner drum shaft and an inside circumference of the outer drum shaft for permitting one way interlocked rotation of the inner, and outer drum shafts, and

second one way rotation means between an inside circumference of the rear end opening in the gear box and an outside circumference of the extension of the carrier for permitting one way rotation of the carrier.

8. A drum type washing machine as claimed in claim 7, wherein the sun gear is formed as a unit with the inner drum shaft.

9. A drum type washing machine as claimed in claim 7, wherein the planetary

gear includes two gears having radiuses, and numbers of teeth, both different from each other fixed as one unit coaxially.

10. A drum type washing machine as claimed in claim 7, wherein the carrier rotates in a direction the same with a rotation direction of the inner drum shaft centered on an axis of the inner drum shaft as the inner drum shaft rotates.

11. A drum type washing machine as claimed in claim 7, wherein the first, and second one way rotation means is one way bearings.

12. A drum type washing machine as claimed in claim 7, wherein there is an oilless bearing between the outside circumference of the inner drum shaft and the inside circumference of the extension of the carrier.

13. A drum type washing machine as claimed in claim 12, further comprising sealing means between an outside circumference of the inner drum shaft in rear of the oilless bearing and an inside circumference of the extension of the carrier.

14. A drum type washing machine as claimed in claim 7, wherein the first one way rotation means permits opposite direction rotation of the inner drum shaft and the outer drum shaft in washing, and holds the outer drum shaft so as to rotate in a direction the same with the inner drum shaft in spinning.

15. A drum type washing machine as claimed in claim 7, wherein the second one way rotation means restricts such that the gear box and the carrier rotate in the same direction in washing, and permits opposite direction rotation of the gear box and the carrier in spinning.

16. A drum type washing machine as claimed in claim 7, wherein the shaft

extension has a diameter greater than a diameter of the outer drum shaft, and smaller than a diameter of the gear box.

17. A drum type washing machine as claimed in claim 2, wherein the inner drum is rotated as the inner drum receives a driving force from a driving motor separately fitted to one side of the tub, the outer drum is fixed to the outer drum shaft at a rear end thereof, and the outer drum shaft is provided with a rotation transmission device for transmission of a rotation force from the inner drum shaft to the outer drum shaft.

18. A drum type washing machine as claimed in claim 17, wherein a power transmission to the inner drum is made by a driving motor fitted in a lower part of the tub, a motor pulley coupled to the driving motor, a drum pulley coupled to the inner drum shaft, and belt means for transmitting the rotation force from the motor pulley to the drum pulley.

19. A drum type washing machine as claimed in claim 17, wherein the tub includes a bearing housing formed as one unit therewith at a central part thereof having a front part and a rear part fitted with a front bearing and a rear bearing respectively, for supporting an outside circumference of the outer drum shaft.

20. A drum type washing machine as claimed in claim 17, wherein, there is a gear box in rear of a rear wall of the tub for holding the rotation transmission device therein.

21. A drum type washing machine as claimed in claim 20, wherein the gear box includes a flange formed along an outside circumference of a front part for fastening the gear box to the rear wall of the tub by fastening means.

22. A drum type washing machine as claimed in claim 21, wherein the flange has a plurality of holes along a circumference for passing fastening means, and the tub has fastening holes in the rear wall at positions corresponding to the holes in the flange.

23. A drum type washing machine as claimed in claim 1 or 2, wherein the drums include a plurality of lifters elongated along an axis direction, and projected form an inside surface to a radial direction.

24. A drum type washing machine as claimed in claim 23, wherein the lifter on the inside surface of the inner drum has a section becoming the smaller as it goes to a front part in an axis direction, and the lifter on the inside surface of the outer drum has a section becoming the smaller as it goes to a rear part in an axis direction.

25. A drum type washing machine as claimed in claim 23, wherein the lifter has a triangular section.

26. A drum type washing machine as claimed in claim 23, wherein the lifter has an "M" section, to form a groove in a top part in a radial direction.

27. A drum type washing machine as claimed in claim 23, wherein the lifter on the inside surface of the inner drum has a helical form for moving the laundry and water in the drum forward (door side) along an axis direction as the inner drum rotates in washing, and the lifter on the inside surface of the outer drum has a helical form for moving the laundry and water in the drum backward along an axis direction as the outer drum rotates in washing.

28. A drum type washing machine comprising:

an outer drum rotatably fitted in a tub, having a rear end an outer drum shaft

fixed thereto, the outer drum shaft having a rear end coupled to a stator fixed to a rear end of a rear wall of the tub;

an inner drum rotatably fitted in the outer drum, having a rear end an inner drum shaft fixed thereto, the inner drum shaft having a rear end coupled to a rotor in the motor part;

a gear box housing extended in a rear direction from a front through hole formed in a central part in rear of a rear wall of the tub formed as one unit with the rear wall, to form a cavity, having a rear through hole in a rear end thereof;

a front bearing, and a rear bearing fitted in the front through hole and the rear through hole for rotatably supporting an outside circumference of the outer drum shaft and the outside circumference of the inner drum shaft, respectively; and,

a rotation force transmission device including a gear box fixed inside of the gear box housing having opened fore end and rear end for allowing the inner, and outer drum shaft to pass therethrough or be inserted therein, a sun gear fitted coaxially with the inner drum shaft for interlocked rotation with the inner drum shaft, a plurality of planetary gears for being rotated by receiving rotation force from the sun gear, a shaft extension extended from the rear end of the outer drum shaft having an inner circumference with a gear part for engagement with the planetary gears, a carrier having a rotation shaft in front of a base, which is a rotation center of the planetary gears, and an extension in rear of the base positioned between the inner drum shaft and a rear opening in the gear box, first one way rotation means between an outside circumference of the inner drum shaft and an inside circumference of the outer drum shaft for permitting one way interlocked rotation of the inner, and outer drum shafts, and second one way rotation means between an inside circumference of the rear end opening in the gear box and an outside circumference of the extension of the carrier for permitting one way rotation of the carrier.

29. A drum type washing machine comprising:

an outer drum rotatably fitted in a tub, having a rear end an outer drum shaft

fixed thereto, the outer drum shaft having a rear end passed through a central part of a rear wall of the tub to outside thereof;

a driving motor fitted in a lower part of the tub having a driving shaft coupled to a motor pulley;

an inner drum rotatably fitted in the outer drum, having a rear end an inner drum shaft fixed thereto, the inner drum shaft having a rear end coupled to a drum pulley for receiving a rotation force from the driving motor by means of belt means;

a gear box fastened to a rear side of the rear wall of the tub by fastening means, having openings in a front end, and a rear end for passing, or inserting the inner, and the outer drum shafts, and a cavity therein;

a front bearing, and a rear bearing fitted in a front part, and rear part of the bearing housing for rotatably supporting an outside circumference of the outer drum shaft; and,

a rotation force transmission device including a sun gear fitted coaxially with the inner drum shaft for interlocked rotation with the inner drum shaft, a plurality of planetary gears for being rotated by receiving rotation force from the sun gear, a shaft extension extended from the rear end of the outer drum shaft having an inner circumference with a gear part for engagement with the planetary gears, a carrier having a rotation shaft in front of a base, which is a rotation center of the planetary gears, and an extension in rear of the base positioned between the inner drum shaft and a rear opening in the gear box, first one way rotation means between an outside circumference of the inner drum shaft and an inside circumference of the outer drum shaft for permitting one way interlocked rotation of the inner, and outer drum shafts, and second one way rotation means between an inside circumference of the rear end opening in the gear box and an outside circumference of the extension of the carrier for permitting one way rotation of the carrier.

FIG.1
Related Art

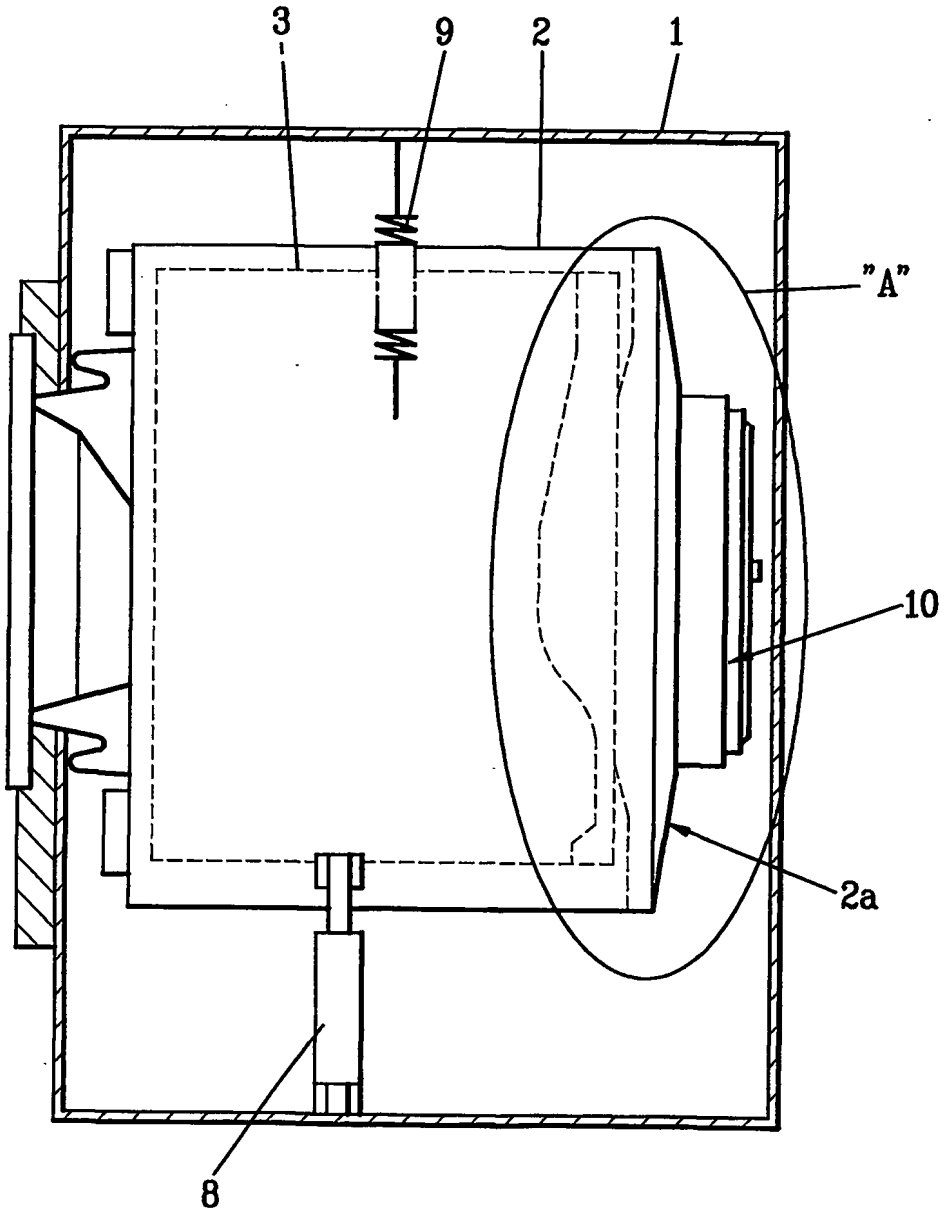

FIG.2
Related Art

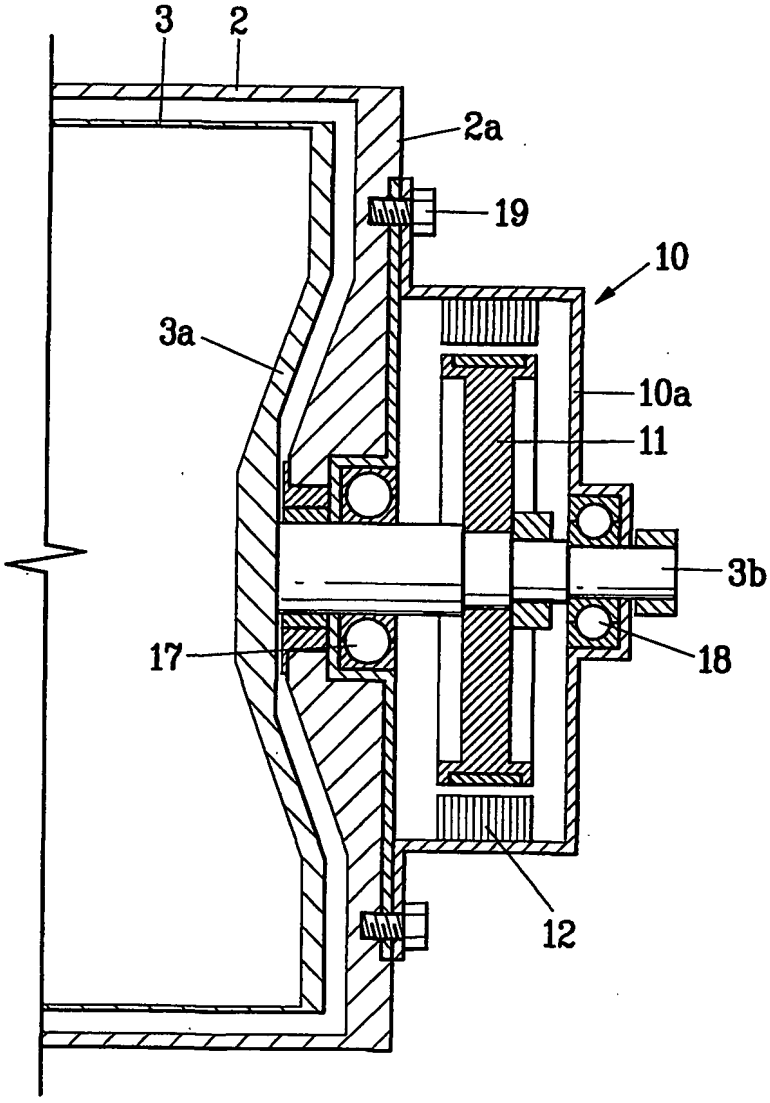

FIG.3

102(b) clm 1

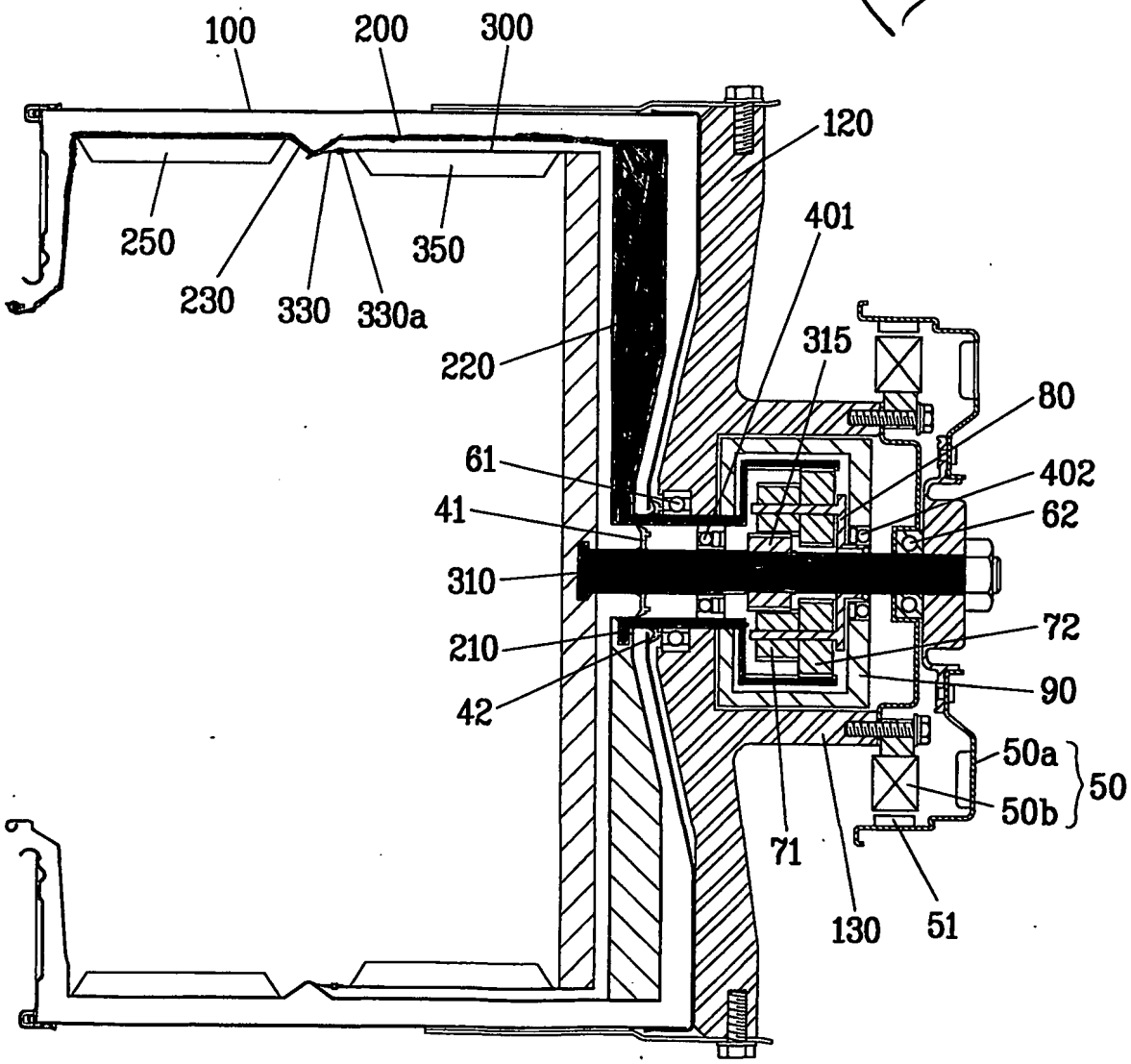

FIG. 4

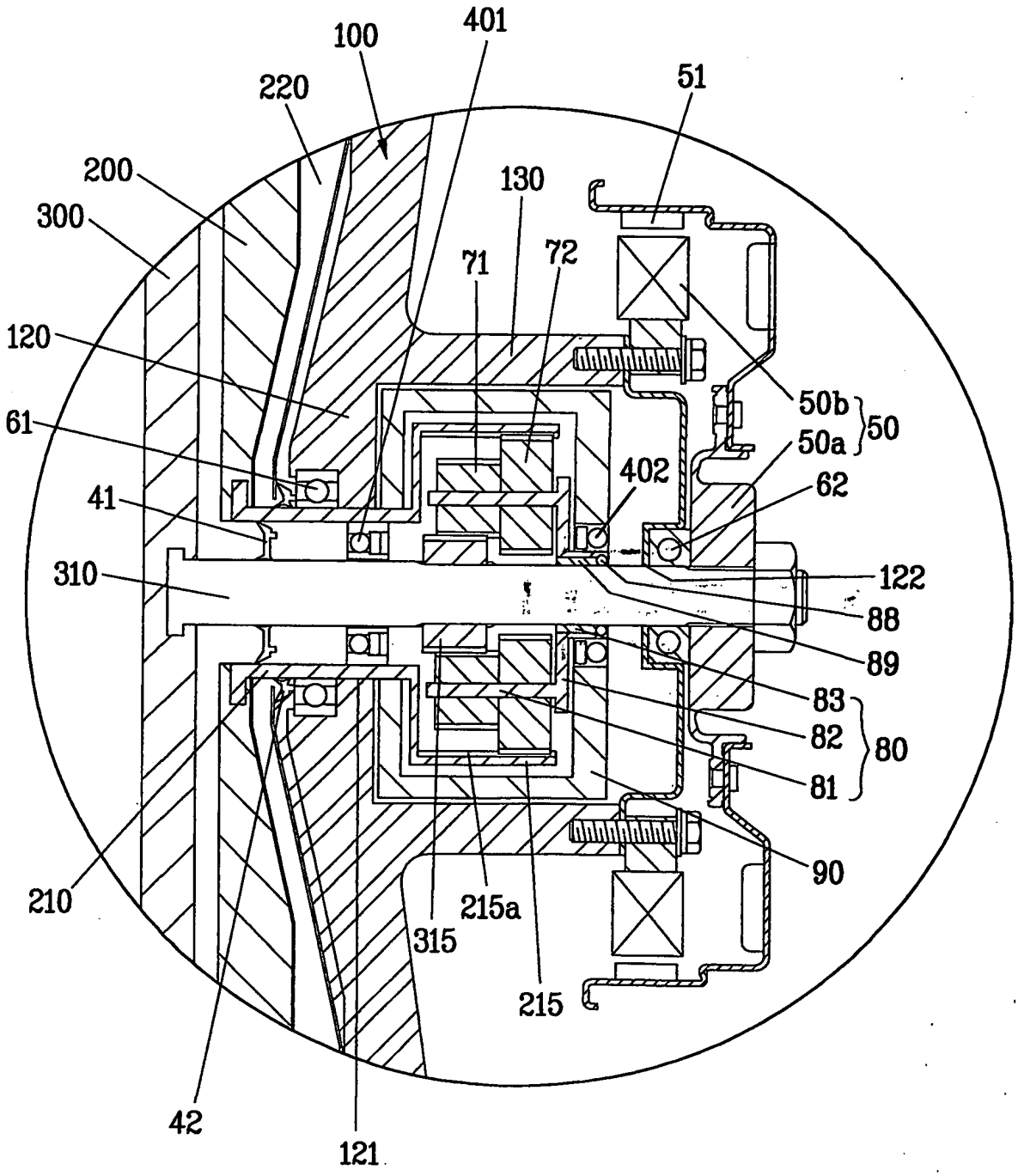
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FIG.5

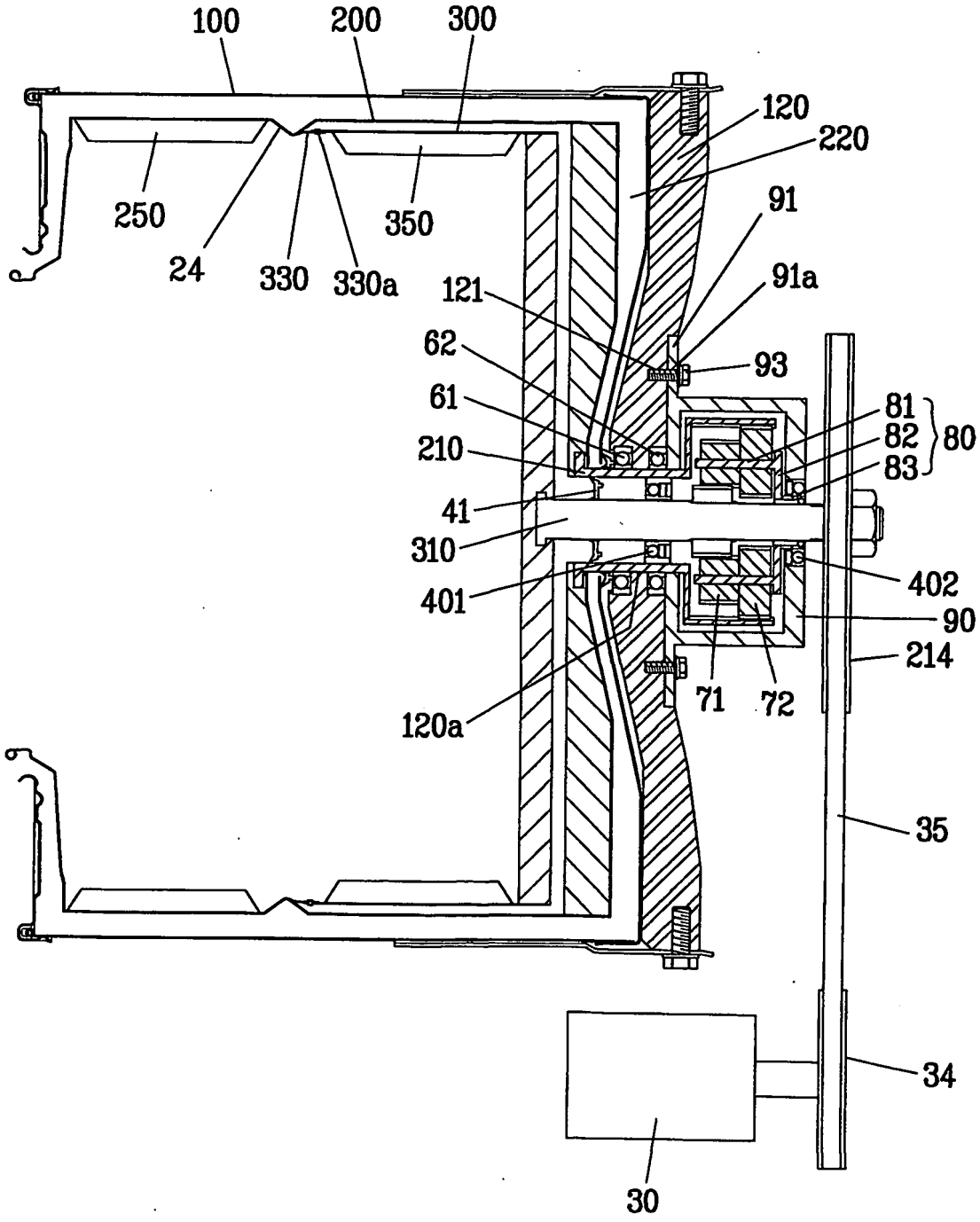
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FIG.6

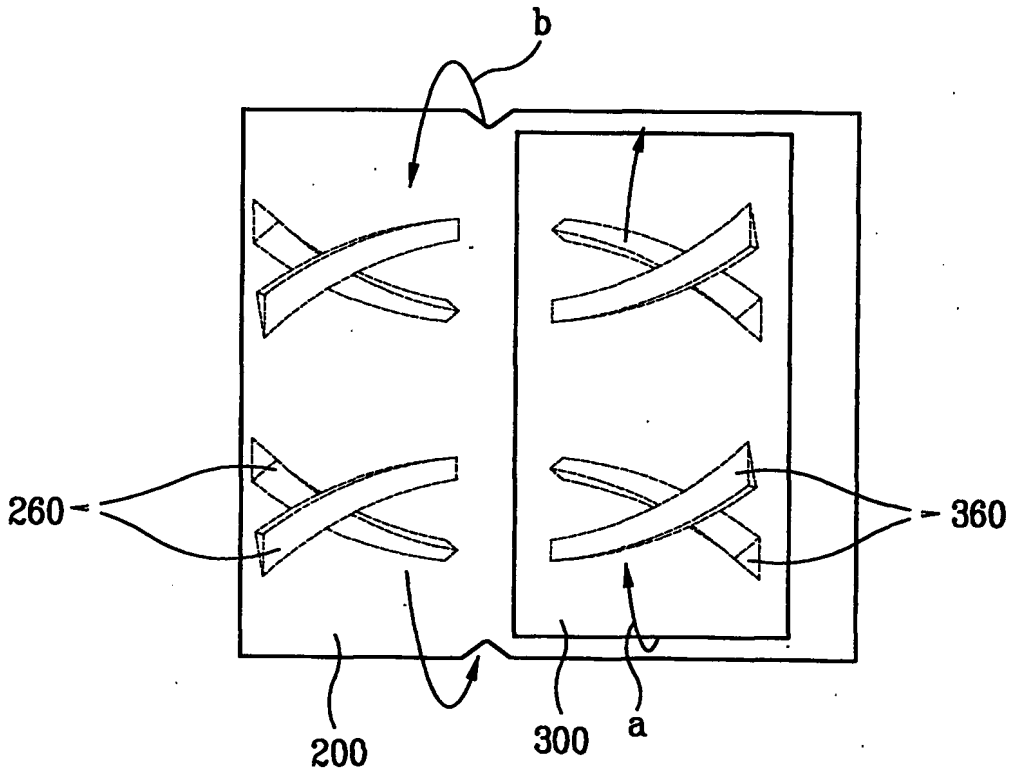


FIG. 7

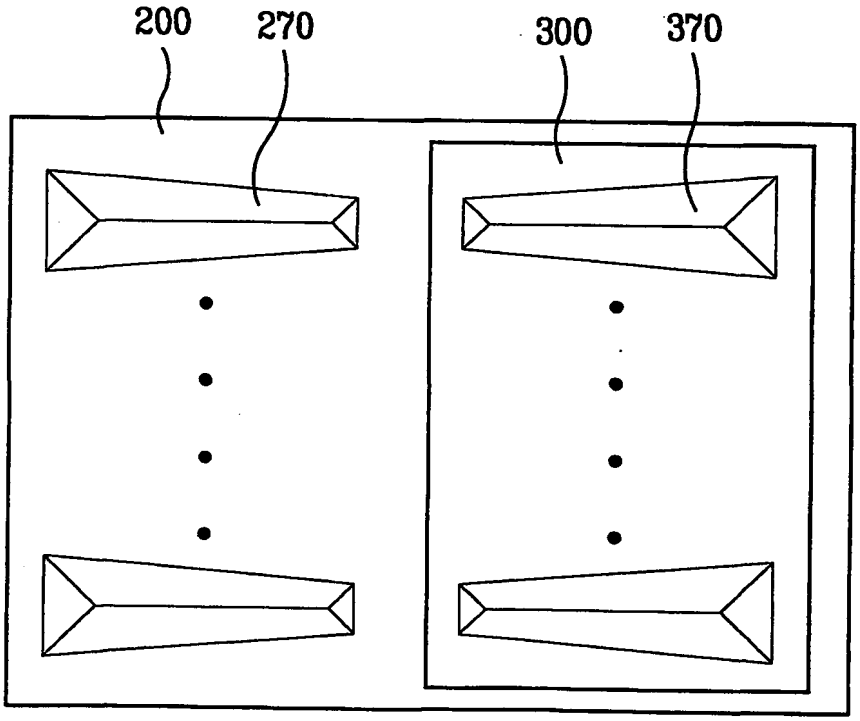
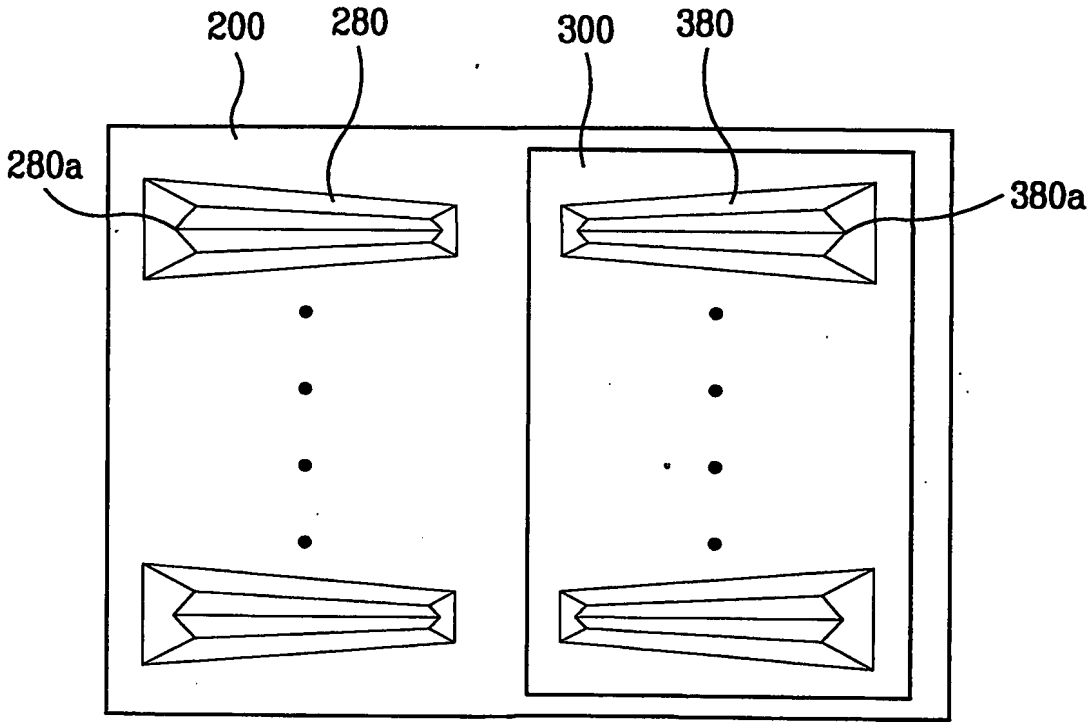


FIG.8



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR01/01948

A. CLASSIFICATION OF SUBJECT MATTER

IPC7 D06F 23/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 D06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

KR ; IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4829792(M.Brent Keith) May 16,1989 Abstract and Fig 2	1, 27-29
A	JP 02277493 A(Sharp Corp) Nov. 14, 1990 Abstract and Fig 1,2	1, 27-29
A	KR 2000-0009517 U(DAEWOO ELECTRONIC) JUNE 5, 2000 Abstract and Fig4,5	1, 27-29
A	KR 2000-0011966 U(DAEWOO ELECTRONIC) JULY 5, 2000 Abstract and Fig4,5	1, 27-29

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevence; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 MARCH 2002 (18.03.2002)	18 MARCH 2002 (18.03.2002)

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